

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

DRURY, THOMAS J.

Serial Number: 09/838,138

Filing Date: April 20, 2001

For: POLYVINYL ACETAL COMPOSITION
SKINLESS ROLLER BRUSH

Examiner Chang

Art Unit 1771

The Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

DECLARATION OF THOMAS J. DRURY

COMES NOW, Thomas J. Drury, who avers and swears that the following statements are true to the best of his belief and knowledge:

1. That I am the inventor of the Polyvinyl Acetal Composition Skinless Roller Brush as disclosed in U.S. Patent number 09/838,138 and have been active in research and development in the polyvinyl acetal foam business for a number of years.

2. That I previously submitted a Declaration summarizing the test results obtained by Applied Materials Inc. on a roller brush product of the present invention which is identified as BPTOne 212XP material (3920-00307) and comparing the same with other rollers used in the marketplace including one developed by me.

3. That a copy of this test report is attached hereto as Exhibit A.

4. That on information and belief, Applied Materials Inc. makes approximately sixty percent (60%) of the world's semi-conductor production equipment.

5. That the inventive roller brushes of the present invention designated BPTOne were also

tested in the comparative testing by Motorola Inc. against Rippey brushes. A copy of this test is attached hereto as Exhibit B.

6. That Rippey brushes are believed to be those disclosed by Bahten Patent No. 6,076,662 (assigned to Rippey Corporation). Rippey Corporation had previously distributed the Kanebo brush (See the Tomita Patent Number 4,566,919).

7. That another independent commentary on the present inventive roller brush by a respected non-affiliated individual consultant is attached hereto as Exhibit C.

8. That the consultant commentator is Hal Bailey, a semi-conductor industry expert who heads several silicon valley think tanks including BASYS Group and Phrason Dynamics.

9. That the present invention has been calculated by Mr. Bailey to result in a savings on one semi-conductor chip processor of Three Hundred Twenty Thousand Dollars (\$320,000.00) per year.

10. That I am familiar with Ronald J. Cercone and Soloman Rosenblatt having worked with both parties for a number of years and am familiar with the products developed by both parties.

11. That roller brushes developed by Cercone and Rosenblatt are not known by me to have gained significant acceptance by the industry and are not believed to have significant, if any commercial usage in the silicon chip industry.

The undersigned declares that all facts and allegations contained in this declaration are true to the best of his knowledge; all statements made herein of his own knowledge are true and that all statements made on information an belief are believed to be true; and further, that these statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States code and that such willful false statements may jeopardize the validity of the

application or document or any registration resulting therefrom.

Respectfully submitted,

Date: October 30, 2003


Thomas J. Drury

Summary

Objective:

- To evaluate, and compare, defect performance of four different brushes, under the same environment.

Tool used:

- 300MM Mirra Messa.

Results:

- BPTone 212XP material (3920-00307) had the best particle removal rate.

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Experimental Details For Tool Qualification

Tools

- S3 300mm Mirra-Mesa
 - Megasonics
 - Brush 1
 - Brush 2
 - SRD
- Metrology
 - KLA-Tencor
 - Oxide BKM recipe

Methodology

- Cycle 100 dummy wafers through the system daily
- Testfire 4 oxide defect wafers
- Defect Qualification is < 30 adders (delta = post - pre) at 0.13 μm
- Cleaning Performance Metrics:
 - Delta = precount – postcount (typically used at customer site)
 - Map-to-map defect analysis not available

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Experimental Details for Brush Type Evaluation

Methodology

- Install Brushes and Run Brush Break-in twice
- Cycle 25 dummy wafers through system
- Testfire 4 oxide defect wafers for qualification
- Defect Qualification is < 30 adders (delta = post - pre) at 0.13 μm
- Testfire 5+ oxide defect wafers for Using BKM 1.1
- Cleaning Performance Metrics:
 - Delta = precount – postcount (typically used at customer site)
 - Map-to-map defect analysis not available

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Objective

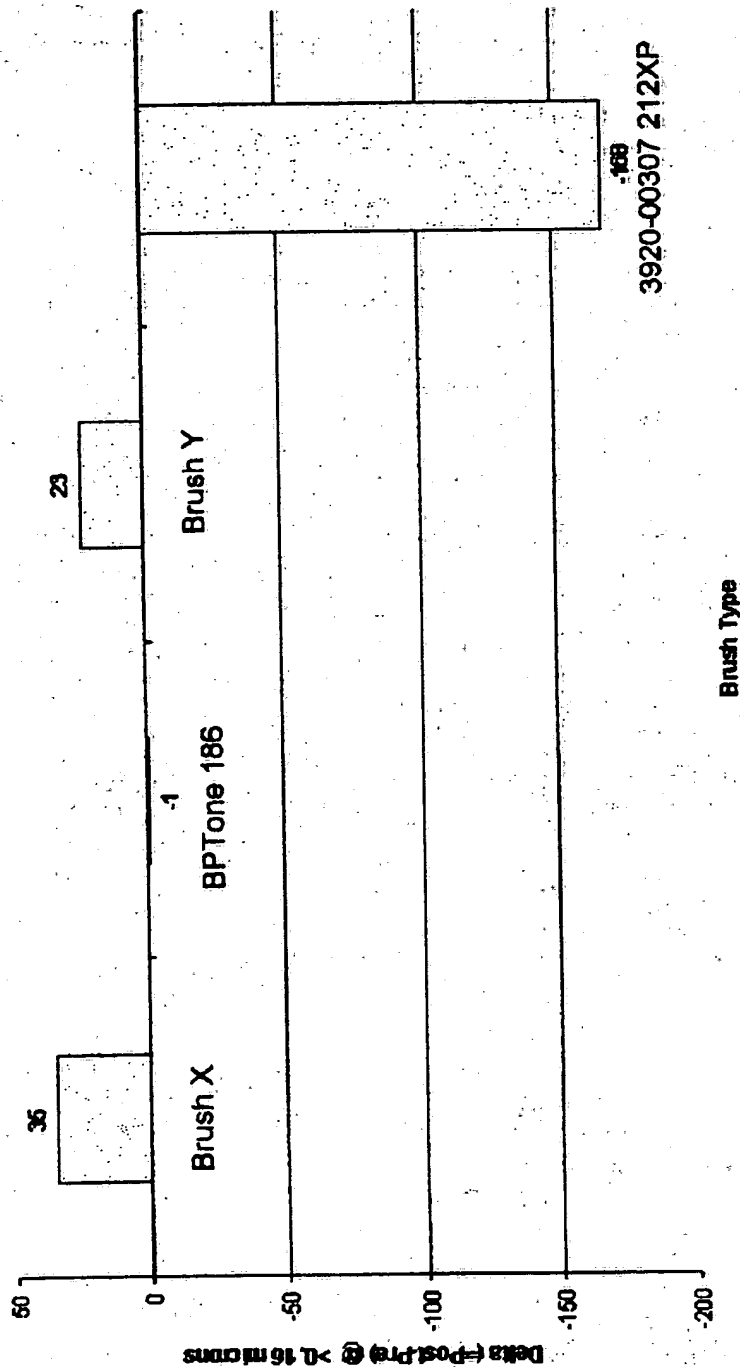
Evaluate Four Different Brushes for Brush Module 2

- Brush types
 - Brush X
 - Brush Y
 - BPT-1 Type 186
 - 3920-00307, BPT-1 Type 212

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Effect of Different Brush Types



BPT-1 Type 212 Brushes Has Best Defect Performance

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Final DI only cleaning test

Final Dry Only Cleaning test				
Wafer	pre-count @ > .16	pre-count @ > .2	post-count @ > .16	post-count @ > .2
1	298	79	14	6
2	241	112	9	2
3	38	20	19	7
4	43	14	14	5
5	46	16	24	4
6	41	15	24	5
7	44	14	26	6
8	52	20	24	6
9	37	6	33	16
10	39	13	22	7
11	48	18	16	1
12	61	16	18	8
13	41	20	33	20
14	59	17	23	10
15	66	24	43	18
Average particles @ > .16 microns (pre) 76.93		Average particles @ > .20 microns (pre) 26.93		Average particles @ > .16 microns (post) 22.80
				Average particles @ > .20 microns (post) 8.07
Average particle removal at > .16 microns			(54.13)	
Average particle removal at > .20 microns			(18.87)	

Wafers 1 and 2 were the main reason for high average particle removal rate. The results of the removal rate average are quite impressive. The BPT One Brushes show better cleaning performance then any other brush I have used. The removal rates generally average from adding 2 particles to removing 3 particles at .2 microns. By removing wafers no. 1 and 2, the removal rate at .16 was -22.77 and at .20 microns -7.89 average. This data shows that the BPT One brushes clean twice as good then Rippey brushes and their equivalent. Of special note in this test, wafer no. 9 was the only wafer to add particles. This is due because originally the wafer showed a scratch across the wafer on the Tencor. It turned out to be a solid line of particles. During post reading, almost all the particles were removed and the wafer no longer had a scratch count. This is the type of issue I mentioned above about smaller particles causing loss of Die.

AREA

Data thrown out due to bad wafers

	Pre BPT area	Post BPT area	Delta BPT area	Pre b area	Post b area	Delta b area	Pre c area	Post c area	Delta c area
1	30	9	-21		10	3	-7	9	0
2	12	7	-5		17	2	-15	14	-5
3	16	1	-15		6	2	-4	12	0
4	14	1	-13		7	4	-3	8	-3
5	3	1	-2		13	3	-10	11	-4
6	10	6	-4		14	7	-7	13	-7
7	10	1	-9		3	1	-2	10	-4
8	5	3	-2		11	3	-8	17	-9
9	3	0	-3		7	7	0	17	-10
10	6	3	-3					21	-17
11	9	4	-5					19	-14
12	19	16	-3					9	-5
13	7	3	-4					9	-7
14	10	6	-4					12	-7
15	12	5	-7		25	5	-20	41	-29
Totals:			-100				-76		-121

Total Defect

Data thrown out due to bad wafers

	Pre BPT Tot. Def.	Post BPT Tot. Def.	Delta BPT Tot. Def.	Pre b Tot. Def.	Post b Tot. Def.	Delta b Tot. Def.	Pre c Tot. Def.	Post c Tot. Def.	Delta c Tot. Def.
1	347	199	-148	223	78	-145	151	140	-11
2	158	88	-130	383	82	-301	355	131	-224
3	117	69	-48	78	39	-39	179	193	14
4	186	110	-76	125	61	-64	128	54	-74
5	123	74	-49	51	39	-12	170	151	-19
6	160	98	-62	175	58	-119	125	66	-59
7	242	72	-170	137	32	-105	288	95	-193
8	129	105	-24	91	54	-37	171	94	-77
9	162	44	-118	87	61	-26	300	77	-223
10	326	62	-264				297	67	-230
11	244	51	-193				407	82	-325
12	208	190	-18				69	85	16
13	204	74	-130				89	79	-10
14	93	120	27				59	104	45
15	111	75	-36	115	70	-45	163	70	-93
Totals:			-1439			-893			-1463

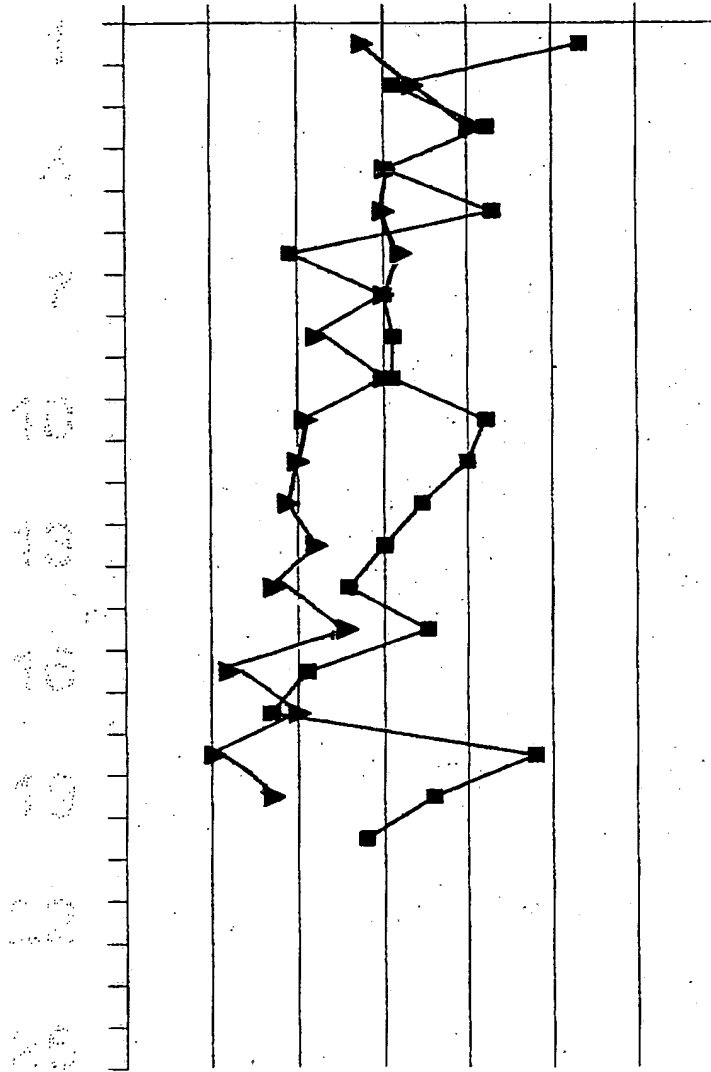
Scratch D fect

Data thrown ut du to bad wafers

	Pre BPT SCR.	Post BPT SCR	Delta BPT SCR	Pre b SCR	Post b SCR	Delta b SCR	Pre c SCR	Post c SCR	Delta c SCR	
1	12	10	-2		0	1	1	6	5	-1
2	5	7	-2		8	2	-6	8	3	-5
3	3	1	-2		6	1	-5	6	7	1
4	4	1	-3		5	2	-3	0	0	0
5	5	5	0		0	0	0	3	2	-1
6	2	0	-2		3	1	-2	3	0	-3
7	3	2	-1		2	2	0	5	3	-2
8	5	6	1		1	2	1	5	1	-4
9	1	0	-1		0	1	1	13	4	-9
10	10	5	-5					5	0	-5
11	4	1	-3					12	3	-9
12	7	2	-5					0	1	1
13	2	0	-2					2	1	-1
14	1	1	0					2	2	0
15	2	0	-2		0	0	0	5	2	-3
Totals:			-29				-13			-41

Normalised Fenchone Data

Run	1	2	3	4	5	6	7
Time	10	10	10	10	10	10	10



Series	1	2	3
Time	10	10	10

Subj: Golden Gate Bridge for President
Date: Monday, October 27, 2003 6:34:47 PM
From: hal@silcon.com
To: td41ho@aol.com

Today, Tom, I had the opportunity to help AVS prepare for the Showcase Program in Portland Oregon. My contribution was to create the scope of information for the keynote address opening the conference and exhibits. The committee had two current users of BPT one Brushes, and the comment requested was "cost of ownership" development.

Why, these two separate users replaced Rippey brushes every 6-8 weeks or less, and with BPT one, they replace twice per year. They invited me to provide a Poster Display of my "next cost of ownership savings" based on the results achieved with the BPT one brushes of 40% savings in water and chemicals coupled to the long-term life of the brushes. Net savings on one processor is \$320,000 per year including the cost of the brushes.

The Poster Board will feature all the technologies of Phrasor Dynamics:

- 1) Super Critical Vapor Phase FEOL reactive/removal processing
- 2) Thermodynamic Vapor Phase BEOL reactive/removal processing
- 3) Contact Reactive/Evacuation Post Processing in plating, coating and CMP
- 4) Electrohydrodynamic DRY-OUT

As part of the Poster Board, BASYS, on behalf of Phrasor Dynamics, has created one poster that reviews polyurethane, poly vinyl alcohol, poly vinyl ethylene, and hybrids including the Extenza formulations. Hydrofera is referenced for hybrid micropore PVA materials. The poster contains a chemical and performance compatability chart that importantly shows Hydrofera's reasons for +300,000 wafer processed by each set of your brushes. The facing poster board will have actual pictures and statistical results form +2 years of usage.

Smile, Tom, the message of performance worked! Only the message was never published or channeled to market! Maybe my courtesy of speaker's notes and poster board copy will help the cause! Try www.avs.org for time and place in Portland Oregon.

Celebrate!

Hal Bailey
Chairman
The Golden Gate Bridge for President Committee